MICHIGAN ENVIRONMENTAL SCIENCE BOARD

ENVIRONMENTAL INDICATORS INVESTIGATION PANEL
MEETING SUMMARY
THURSDAY JULY 20, 2000
COURTYARD BY MARRIOTT
7799 CONFERENCE CENTER DRIVE
BRIGHTON, MICHIGAN

PANEL MEMBERS PRESENT
Dr. Bette J. Premo, Chair
Dr. Robert J. Huggett
Dr. David T. Long
Dr. Dean Premo
Dr. William W. Taylor
Dr. George T. Wolff
Mr. Keith G. Harrison, Executive Director

MDEQ/OSEP SUPPORT STAFF PRESENT
Mr. Jesse Harrold, Environmental Officer
Ms. Linda Albro Sparks, Executive Secretary

I. CALL TO ORDER

Dr. Bette Premo (White Water Associates, Inc.) called the meeting of the Michigan Environmental Science Board (MESB) Environmental Indicators Investigation Panel (Panel) to order at 9:05 a.m. She asked that the Panel members introduce themselves. Dr. Premo indicated that she was a member of the MESB and that her specialties were limnology or freshwater chemistry, and biology.

Dr. Robert Huggett (Vice President, Research and Graduate Studies, Michigan State University - MSU) indicated that he had served as an Assistant Administrator for the U.S. Environmental Protection Agency (USEPA) for three years, and as a professor of environmental science at the College of William and Mary for 29 years.

Dr. William Taylor (Acting Dean, College of Agriculture and Natural Resources, MSU) stated that he had been Chair of Fisheries and Wildlife, and had worked with Great Lakes fisheries.

Dr. George Wolff (General Motors Corporation) indicated that he was a member of the MESB and was an atmospheric scientist with 25 years experience.

Dr. David Long (Geology Department, MSU) stated that he was a member of the MESB and that his expertise was in aqueous and environmental geochemistry.

Dr. Dean Premo (White Water Associates, Inc.) indicated that his expertise was in zoology and ecology with a special interest in riparian areas.

Mr. Keith Harrison (Executive Director, MESB) stated that he was a member of the MESB and that his background was in terrestrial ecology and environmental health. Mr. Harrison noted

that Dr. Keeler (University of Michigan) would also be serving on the Panel. His expertise was in air quality issues.

II. GOVERNOR'S CHARGE

Mr. Harrison provided a brief background on how the MESB was given the charge from the Governor. He indicated that the federal government and many states have instituted programs to assess and track the quality of the environment. According to him, the USEPA has developed a three-tiered approach which incorporates program outputs to count specific items (such as the number of permits issued, enforcement actions taken, etc.) program outcomes to assess how well individual programs operate, and environmental indicators to directly measure change in the environment. Several states environmental agencies have followed this lead while others have chosen to incorporate only portions of it. According to Mr. Harrison, the Michigan Department of Environmental Quality (MDEQ) in its 1999 Environmental Quality report only reported on environmental indicators and program outcome measures. Shortly after this report was published, Public Act 195 of 1998 was passed by the Legislature, further defining how the state of Michigan's environment was to be reported on. The MDEQ was asked to work with the Michigan Department of Natural Resources (MDNR) to prepare a biennial report on the quality of the environment, based on scientifically supportable environmental indicators and using sound scientific methodologies. The first report is to be generated in October 2001, followed by additional reports every two years.

The Governor's charge to the MESB is to review the environmental indicators proposed for use in the report by the two departments to see whether they have a sound scientific basis, and also to determine if change in the quality of the environment can be ascribed to observed changes in indicator values from one reporting period to the next. The MDNR and MDEQ proposed measures were either currently being monitored or have been proposed to be monitored in the future. Review of these indicators does not necessarily preclude the Panel from suggesting other indicators. Upon completion of the MESB report, the MDNR and the MDEQ will take the MESB recommendations under consideration in preparation of their report to the Legislature.

III. MDNR INDICATORS

Mr. George Burgoyne (Resource Management Deputy, MDNR) stated that he did not have a presentation prepared, but would be able to answer questions. Dr. Taylor asked how the proposed MDNR indicators had been chosen. Mr. Burgoyne replied that specialists from each of the department's resource divisions had met to discuss what indicators would be appropriate and realistic measurements of the environment.

Michigan Land Use – This measure looks at both land cover and land use, using satellite imagery for evaluation. Change in wetlands and amount of wetlands is one subcategory of land use and cover. Dr. Huggett noted that MSU has a land use and cover program with a download system for the NASA satellites. Mr. Burgoyne indicated that this was being used by his department as one data source. Another available resource is a model of future estimates of growth in Michigan based on current policies.

Dr. Wolff noted that there was a report available profiling Southeast Michigan's environment, with indicators as well as background data. Mr. Harrison stated that he could distribute copies of this report, however, some of the indicators were very region-specific and not applicable to the state as a whole.

Dr. Taylor noted that one point of interest that should be considered, from a species or community point of view, is fragmentation, and how it relates to structure and function. He stated that it was important to consider corridor width and other facets of landscape ecology.

Dr. Long commented that land use change is a major driving force for what is currently happening in the environment. He added that measuring these changes is important.

Dr. Bette Premo stated that people making zoning and other decisions on a local level need an indication of what is happening to the land use and land cover, as well as the ecological effect of changes. Dr. Huggett indicated the USEPA had reported that the largest ecological changes caused by humans result from land use. Dr. Long added that notation of changes in land use would need to be accompanied by an evaluation of whether those changes were good or bad. Dr. Dean Premo noted that one factor to consider when evaluating data was the purpose for the data collection. The health of the environment is not always adequately evaluated when the data collection is commodity driven.

Species Diversity – Dr. Bette Premo questioned whether there were indicators chosen from the various animal groups regulated by the fisheries or wildlife divisions. Mr. Burgoyne responded that fisheries decided to go with stream flow as an indicator as it was currently being measured. He added that shocking surveys have been conducted, but did not provide a sufficient data set to make statewide indications. He noted that there are data collected before fishing limits are set, but much of the resulting regulations is socially, as well as biologically driven. Dr. Taylor noted that it could be difficult to choose the appropriate specific species as the indicator for change.

Dr. Long stated that he would classify stream flow as a driving indicator, with species diversity and fish populations as other important considerations. Dr. Bette Premo said that there must be a native species useful as an indicator of environment conditions.

Dr. Long stated that he was in favor of having Master Stations, which he described as sites around the state where there is intense monitoring of the certain parameters. Dr. Dean Premo agreed that the use of stations was a valid concept as it was impossible to monitor everywhere in the state. He added that extra data collection could be incorporated into current biological surveys such as the ongoing Gypsy moth trapping. Mr. Harrison indicated that the concept of Master Stations could help coordinate the collection of data by the various state agencies. He added that some statewide surveys, such as monitoring the breeding birds, are well established and well done with considerable volunteer help, and could be utilized to supplement the data collected at the Master Stations. Dr. Huggett noted that there are both temporal and spatial considerations, with rapid changes needing more frequent monitoring.

Dr. Taylor suggested considering indicator species in both wildlife and fish. He noted that studies on the Huron River using data from the 1930s, 1950s and 1990s showed surprisingly minimal differences in the fish. He suggested investigating the work being done on Sturgeon, for an indicator species. Dr. Long suggested using indicators of the aquatic environment, insects and algae, instead of measuring fish themselves. Dr. Huggett noted that there were underutilized data sets available, such as the stations at Pellston Lake and Gull Lake, which have collected samples for many years.

Dr. Bette Premo asked if soil ecosystems were being evaluated. Dr. Long responded that at MSU, some current projects dealt with soil maps, but the data are incomplete. Mr. Burgoyne noted that soil information might be available from the Michigan Department of Agriculture (MDA). Mr. Harrison added that the MDA dealt with agricultural practice and productivity, and might also have information on land loss or other issues.

Mr. Burgoyne noted that the Michigan Natural Features Inventory, part of the MDNR Wildlife Division, conducted surveys of selected endangered species, as well as determining the overall distribution of certain species. Mr. Harrison noted that certain endangered species were very localized and changes in their status would not be representative of the environment of the state as a whole. Dr. Taylor stated that another source of data is the Ecological Services Office of the Fish and Wildlife Service. Dr. Bette Premo noted that one issue was the concept of interior species of birds versus edge species and the effect of fragmentation on these two categories. Edge species can be defined as those that do well in conjunction with human activities, but this category also includes some birds that are currently not doing well. Dr. Taylor mentioned a book on landscape ecology, by Tom Sisk and Nick Head, which he would be able to provide the citation to the Panel.

Dr. Huggett noted that the legislation asked for recommendations to be included in the report regarding future data gathering in order to better define the environment. Mr. Burgoyne reported that the proposed indicators provided what were felt to be realistic and possible, rather than what might be ideal. Dr. Taylor stated that it was important to be clear on how the indicators were chosen, and whether the original purpose was still valid.

Dr. Bette Premo questioned the status of the program to monitor lichens. Mr. Burgoyne responded that this is a part of the Forest Health Monitoring Program, with data from Michigan and other states. This is a possible indicator of air quality, with measures of changes in nitrogen and sulfur-based pollutants.

Forest Acreage and Timber Volume, Mortality, Growth, and Removals - Dr. Bette Premo noted that this is a very managed environment, but what is taken from the forest is often what is monitored, rather than what is left behind. Dr. Huggett stated that there are several definitions of a forest according to various federal agencies, including the ability to have a profitable harvest. Dr. Bette Premo reported that forestry is a major industry in this state, second only to automobiles. She suggested that the foresters might be able to inventory vegetation structure and diversity before and after the extraction process.

Dr. Taylor noted that about 60 percent of forested land is in private ownership. Good management practices can be difficult to integrate, but are important, especially as national forests and possibly state forests have started reductions in cutting. Dr. Dean Premo stated that he was concerned that the primary use of Michigan's forest was assumed to be wood fiber extraction. He noted that there are many uses of the forests, with organisms other than humans involved. Mr. Burgoyne stated that in working with private landowners, there was a current emphasis on development of an ecosystem approach to consultation, rather than concentrating on cubic feet of timber. Dr. Bette Premo added that this type of education needed to be used with local loggers and tree markers, as well as with landowners. However, forest management is very dependent on the amount of wood cut. Agencies such as the MDNR, as well as loggers, receive a major source of revenue from extraction, rather than from ecosystems or recreation.

Dr. Huggett characterized the MDNR program as not that coherent, with individual measures such as frogs, lichen, or streams insufficient to characterize the health of the environment. He questioned the number of samples needed to determine trends in even an individual species. Dr. Dean Premo added that there should be an overview segment in the MESB report that states that this is an adaptive monitoring program with periodic re-evaluations of the validity of indicators.

Dr. Huggett reported on a recent document by the Environmental Monitoring Assessment Program (EMAP) of the USEPA, which developed criteria for evaluation of indicators. The criteria included robustness and statistical validity. One indicator category is the extent and status of the nation's ecosystems. This deals with land cover and land use. Another is ecological capital, which addresses total species diversity, native species diversity, and soil organic matter. The third category is ecological functioning, which would include carbon storage, production capacity, productivity, lake trophic status, oxygen in streams, nutrient use and nutrient balance. He indicated that the EMAP program was an example of an integrated approach.

Dr. Huggett restated the value of Master Stations as an efficient and cost effective means of data collection and monitoring. Mr. Harrison noted that there is a need for coordination in the collection of data and the selection of representative locations for these stations. Dr. Long stated that there should be ten stations in Michigan with common variables that all the stations would be monitoring. He noted that sites currently being monitored could incorporate these new measurements. Dr. Bette Premo added that cooperation with the universities could be a source of funding. Mr. Harrison noted that this would be a long-term program and both state government and the university system would have the stability to work on this, possibly in partnership. Dr. Huggett reported that there are a number of federal agencies, such as the USEPA, which have been looking at large ecosystems. Mr. Harrison noted that the USEPA has been promoting its environmental partnership program (which incorporates the collection of program output, program outcome and environmental indicator data), but that Michigan was not currently involved in this since there is some question about the usefulness and scientific validity of many of the parameters requiring measurement by the USEPA.

IV. MDEQ INDICATORS

Air Quality – Dr. Wolff reported that there are various measures of air quality. One is the concentration of a particular contaminant, with measurements of the criteria pollutants available for the past 20 years. Data on air toxics are fairly recent, with a much less comprehensive database. A second measurement is a pollutant standard index, or a similar analysis such as the number of unhealthful days. These are less scientific measurements, being based on judgment, and are more open to interpretation. Emission rates are a third type of indicator. This is a process with a high degree of uncertainty, estimated from source inventories. Electrical generation plants have fairly reliable continuing emission monitors, but most other sources use periodic stack sample measurements or engineering calculations. Emissions are actually more of a program measure than an environmental indicator, but provide readily available data.

Dr. Wolff stated that air contamination has two effects. One is when it is inhaled, and the other is when it deposits to the ecosystem and becomes biologically available. Important data would be rates of deposition of persistent and bioaccumulative air toxics.

Dr. Wolff listed the six criteria pollutants as carbon monoxide, sulfur dioxide, nitrogen dioxide, particulate matter, ozone, and lead. Lead is currently only an air problem in a very few areas with local smelters. The major source, burning gasoline, no longer exists. Dr. Wolff noted that carbon dioxide is not considered a pollutant, and there is not a statewide measuring program. He indicated that there are few ecological or biological indicators of air quality, noting that while pollution is decreasing, asthma is increasing.

Regarding climate, Dr. Wolff reported that there is a network of 100 sites within Michigan where data are collected. However this database is not well utilized. Dr. Huggett noted that climate is important relative to land use and land cover. He added that biological distribution and ecosystem type was related to climate, and predicted changes could be calculated based on known biologic response to temperature changes. Dr. Long noted that the greatest diversity of tree species was seen in Michigan, where the two major weather patterns meet. This could be a valuable indicator of the effects of climate change.

Inland Lake Productivity and Quality – Mr. Harrison stated that the MDEQ Inland Lake program is another area with large volunteer activity and data collection organized by the Michigan Lakes and Streams Association. There is some question regarding the consistency of the data being collected, and it might not be as efficient as it could be with greater funding. Dr. Dean Premo noted that recent work in Maine has related the measure of water clarity to property values. This is an example of a direct economic measurement. Dr. Long stated that the timing of measurements is critical and needed to be consistent for the data to be valuable. However, changing climate could affect these values as well. Dr. Taylor indicated that the universities could help to standardize and increase the number of lakes being measured. Dr. Bette Premo noted that transparency, total phosphorous, and chlorophyll *a* are standard factors measured; with some groups also measuring dissolved oxygen. She stated that Wisconsin had a good model of lake monitoring with attention paid to quality assurance and other details.

Dr. Bette Premo mentioned the Carlson Trophic State Index (TSI) as a good indicator of factors such as nutrient loads. Variations in individual lakes from month to month are less important than the average statewide. Dr. Dean Premo noted the need for an assessment of riparian area quality, which could be used to relate to changes in the TSI.

Contaminants in Bald Eagles – Mr. Harrison noted that data collection on the level of contaminants in bald eagles is increasing, with more samples being taken. There is a five-year program with blood and feathers to be collected at 12 fixed locations. The samples are looking for mercury and polychlorinated biphenyls in particular. It was mentioned that these data might be coordinated with information gathered by the MDNR on eagle nesting. Eagles are a top predator and also have a long life. However, it can be difficult to determine where feeding sites are, and thus the contamination source. Eagles eat carrion, as well as animals other than fish. Dr. Dean Premo noted that there had been discussion of using snapping turtles or mink, which depend more on the lakes for their diets. Dr. Huggett stated that eagles are a good sentinel for the effects of DDT, but it is questionable whether the same is true for other contaminants.

Dr. Huggett mentioned the Patuxent Wildlife Center in Laurel, Maryland as a possible data source. He noted that they had been conducting a nationwide sampling of fish and wildlife. Mr. Harrison stated that this could be useful if there was a reasonable assurance that this program would continue to function. Dr. Huggett also mentioned the Environmental Specimen Banking Program of the National Institute of Standards and Technology. This is an international effort,

with yearly collections of specimens. The frozen specimens are stored for future analysis as indicated.

Sediments - Dr. Huggett stated that sediment measure is a good way to determine trends. Depending on sedimentation rates, it is not generally feasible to expect sampling of just one particular year. Dr. Taylor noted that with sediments, it was not possible to see bioaccumulation in the longer-lived species, as seen in salmon. Dr. Long indicated that information from sediment regarding chloride, boron, and aluminum, as well as mercury could show various impacts on the local environment and watershed. However, there are some contaminants in the water that will not get into the sediments.

Contaminants in Fish - Dr. Huggett stated that fish might be a better indicator than the eagles, however, it would be best to sample populations which were less mobile. Fish that migrate far might not be a good choice, other than for contaminant accumulation in the state as a whole.

Wetlands – Wetlands were mentioned as an indicator that was missing from those being considered by the MDEQ. Dr. Huggett indicated that this would logically tie in with land use and land cover. Dr. Dean Premo questioned the amount of wetlands in the state destroyed yearly by permit, and then mitigated for by creation of new wetland. Mr. Harrison responded that there was not a database for this. Dr. Dean Premo added that there was a national wetlands inventory, however, wetlands less than about three to five acres do not show up on the aerial photography used.

V. PANEL DISCUSSION

Dr. Dean Premo asked why some of the divisions in the MDEQ had not proposed any indicators. Mr. Harrison responded that many measures, such as landfill and groundwater cleanups, are done on a local basis. Responsibilities of divisions such as the Environmental Response Division, Storage Tank Division, and the Waste Management Division include important parameters that are included in the MDEQ yearly environmental quality reports. However, these are program outcome measures rather than statewide environmental indicators. The MDEQ is also involved in drinking water concerns, and coordinates with local health departments in matters such as beach closings; but here again, these measures are localized. Dr. Huggett noted that microbial organisms such as fecal coliform are also localized, and while not necessarily harmful to the environment, can be indicative of other things such as leaking septic tanks. Dr. Taylor added that analyses of coliform and *e. coli* bacteria are difficult, and have provided inconsistent data to date. Other contaminants that do not have an identifiable source, but which have been found in streams, are caffeine and steroids.

IV. PUBLIC COMMENT

Ms. Jackie Scott (Michigan Department of Community Health) stated that the Panel is dealing with critical issues of great interest to the public, including the measurement of contaminated fish. She noted the importance of considering public health concerns when assessing the scientific methods for evaluating the environment.

Mr. Mike Johnston (Michigan Manufacturers Association) noted the value of a third party scientific group for evaluation of these important issues. He stated that it was important to have an honest view of the quality of the environment. Mr. Johnston added that climate change is not necessarily bad, as positive effects are seen as well.

V. PANEL ASSIGNMENTS

Dr. Bette Premo outlined the basic format for the report and indicated writing assignments. Mr. Harrison would handle introductory material, including the purpose of the Panel and an overview of the charge. Proposed indicators would not be separated according to MDEQ or MDNR, but would be divided into either ecological or physical/chemical. Ecological indicators include land use and cover, which would be addressed by Dr. Long; biological diversity would be covered by Dr. Dean Premo and Dr. Taylor; wetlands would be discussed by Dr. Dean Premo; and inland lake productivity would be evaluated by Dr. Bette Premo. The biological diversity category includes birds, fish, invasive species, mammals, amphibians, stream insects, stream flow, vegetation, and forest ecosystems.

Physical/chemical indicators, including air quality, will be covered by Drs. Wolff and Keeler; fish contaminants will be written by Dr. Taylor; sediment contaminants will be addressed by Dr. Long; and water contaminants will be addressed by Dr. Huggett. Stream flow will also be included, but was not yet assigned. Recommendations of the Panel will include Master Stations, addressed by Drs. Long and Huggett; climate by Dr. Wolff; ecological versus economic based measures by Dr. Dean Premo and Dr. Taylor; scientific methods by Dr. Huggett; and an adaptive approach, unassigned. Radiological monitoring and contaminant levels in bald eagles will be referred to, but with the assessment that these were currently less helpful in determining the health of the ecosystem. Mr. Harrison will do references and appendices.

All completed Panel writing assignments should be sent, electronically, directly to Mr. Harrison. Also, additional reference material that is cited by a Panel member in his or her writing assignment should be sent to Mr. Harrison who will distribute copies to all Panel members. Mr. Harrison indicated that he would try to obtain a copy of the USEPA EMAP program and a copy of the recent book entitled, *Ecological Indicators for the Nation*, for the Panel.

VI. ADJOURNMENT

The meeting was adjourned at 2:55 p.m.

Keith G. Harrison, M.A., R.S., Cert. Ecol.
Executive Director
Michigan Environmental Science Board